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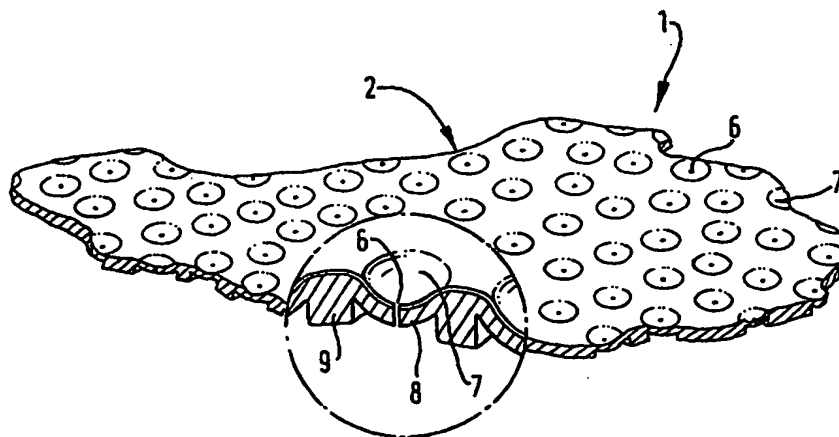
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(21) International Application Number: PCT/GB99/04161 (22) International Filing Date: 10 December 1999 (10.12.99) (30) Priority Data: 9827412.9 11 December 1998 (11.12.98) GB (71)(72) Applicant and Inventor: <i>11 J M E O U / 30 m</i> MIDDLETON, Nigel, John [GB/GB]; Tregonce Cliff, Tregonce, St. Issey, Wadebridge, Cornwall PL27 7JQ (GB). (74) Agent: BROWN, David, Leslie; Page Hargrave, Southgate, Whitefriars, Lewins Mead, Bristol BS1 2NT (GB).		(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), DM, EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published With international search report.

(54) Title: BREATHABLE ARTICLES AND FABRICS



(57) Abstract

A breathable article, such as for example a medical dressing or a facing, cushioning or lining article for wearing or locating between a person and a surface of (i) apparel or clothing, (ii) a chair, (iii) a wheelchair, (iv) headwear, (v) footwear, (vi) body protectors, armour and shields, (vii) bedding, (viii) upholstery coverings, or (ix) orthopaedic articles, is formed from an elastomeric (e.g. foamed neoprene) fabric sheet (1). The fabric sheet has first (2) and second major faces and small pin-prick sized perforations (6) provided therethrough in the centres of surface depressions or chambers (7) of the first major face (2) and corresponding dome projections (8) of the second major face. The fabric sheet as illustrated will typically be cut to the desired shape to form the finished breathable article. Between the perforations (6) is provided a plurality of spacer members in the form of a network of continuous ribs (9) which project from the second major face and serve in use to space the fabric sheet (1) from the surface to maintain breathability via the venting of air through the depressions/chambers (7) and the perforations (6). The ribs (9) can have an air-permeable sheet cover member (not shown) secured thereto extending between adjacent ribs to enclose an air space between the ribs. The invention also provides the corresponding breathable fabric from which the above breathable articles (and others) can be produced.

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BREATHABLE ARTICLES AND FABRICS

The present invention relates to breathable articles, and more particularly articles that in use are disposed at least intermittently between a part of a body of a person or animal and a surface (which may optionally be perforated). Such articles may, for example, include facing, cushioning and lining articles permanently or releasably affixed to any surface, or for wearing or locating between a person or animal and any surface; e.g. apparel of all types (e.g. watersports apparel), parts of wheelchairs, facing, cushioning and lining for seats of all types (e.g. automotive seating, office seating, domestic seating, boat seating, commercial travel seating such as bus, train and aircraft seating), headwear of all types, shoe insoles, helmet linings, linings for body protection or body armour, lining for sports shields such as shin-pads, under-blankets for bedding, upholstery covers, linings for clothing, medical dressings, orthopaedic cast linings or linings for orthopaedic supports or hard braces. The articles may also include medical and veterinary dressings, which may for example be held onto the body by an overlying cover member or by winding the dressing onto itself around the part of the body. The word "article" used herein includes portions of articles. The invention also relates to breathable fabrics from which such articles (and others) can be manufactured.

International (PCT) Patent Application No. WO-A 91/12958 (Armstrong and Middleton) (the disclosure of which is incorporated herein by reference) discloses a breathable insulating fabric in which perforations are provided, the fabric being so configured in the region of each perforation that on one side of the fabric a dome projection extends and on the other side a hollow depression chamber is provided in the fabric (Fig. 2a). In an alternative construction, the dome may be omitted (Fig. 1). The dome version is marketed by Micro Thermal Systems Limited of Bodmin, UK (tel: +44 1208 79999; fax: +44 1208 79990), under the trade mark STOMATEX.

A disadvantage of known breathable fabrics lies in the fact that the breathing action can be inhibited if an article made from the fabric is disposed between a part of a body of a person or animal and a surface. The disadvantage is particularly serious if the surface is hard and/or unperforated and/or if there is a positive external pressure on the article,

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for example from the weight of the person or animal or from the surface being held tightly against the article.

It is an object of the present invention to go at least some way towards overcoming the above disadvantage, or at least to provide an alternative to the existing products.

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According to a first aspect of the present invention, therefore, there is provided an article comprising a sheet having first and second major faces directed respectively to first and second sides of the article and adapted to be disposed at least intermittently in use between, to the first side, a part of a person or animal and, to the second side, a surface, the sheet being formed of a substantially impermeable material having perforations provided therethrough, characterised in that there is further provided a plurality of spacer members which project from at least one of the said major faces of the sheet between perforations of the sheet for spacing the sheet from the said part of the person or animal, from the said surface, or from both of these, whereby in use between both the surface and the part of a person or animal the article is breathable to restrict discomfort to the person or animal. Such an article will generally, although not necessarily always, be in sheet form, i.e. with no additional non-sheet component parts.

According to a second aspect of the present invention, there is provided a breathable fabric, for use particularly, but not exclusively, in manufacturing an article according to the first aspect of the present invention, the fabric comprising a sheet having first and second major faces and formed of a substantially impermeable material having perforations provided therethrough, characterised in that there is further provided a plurality of spacer members which project from at least one of the major faces of the sheet between perforations of the sheet for spacing the sheet in use from a part of a person or animal, from a surface, or from both of these on opposite major faces of the sheet. The fabric will typically be cut to the desired shape, and any desired additional component parts of the article attached or formed, to prepare the finished breathable article.

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In a particular embodiment, the spacer members project from at least the second major face of the sheet (optionally from only the second major face of the sheet) for spacing the sheet from the said surface.

5 In a further embodiment, the spacer members may project from at least the first major face of the sheet (optionally from only the first major face of the sheet) for spacing the sheet from the person or animal.

10 In a preferred form of the invention, the sheet further includes a hollow depression or chamber provided in the first major face of the sheet in the region of each perforation. In the way described in WO-A 91/12958, such an arrangement permits air passing from the first to the second side of the article to accumulate in the depression or chamber under increased vapour pressure prior to passing out to the second side of the article.

15 Furthermore, one depression or chamber may be associated with more than one perforation. The cross-dimension of the depression or chamber may, for example, be in the range of about 0.4 mm to about 50 mm, more typically about 0.4 mm to about 30 mm. The surface density of depressions or chambers on the sheet may be up to about 500,000 m⁻², for example between about 200 and about 500,000 m⁻². The size and surface density of depressions or chambers can be chosen by one of ordinary skill in the art, according to the breathability properties required. For example, a surface density of over 100,000 small depressions or chambers per m², with associated perforations typically having a cross-dimension of less than about 0.1 mm, e.g. possibly as low as about 0.01 mm, may be useful for specialised articles such as medical or veterinary dressings or other coverings.

25 The thickness of the sheet may be chosen to suit the desired application of the article. For example, the thickness may be from 0.5-100 mm, e.g. less than about 50 mm, particularly from 1-30 mm, most particularly from about 3 to about 15 mm.

30 The perforations may be of any convenient or advantageous shape, e.g. circular, slit-like or elliptical, when viewed along their lengths, and suitably have a cross-dimension up to about 5 mm (e.g. from about 0.01 mm to about 5 mm). The perforations are suitably

about the size of a pin-prick, e.g. about 0.2 to about 2 mm in diameter. The centres of adjacent perforations may suitably be up to about 100 mm, e.g. up to approximately 30 mm, apart and the perforations may, for example, be arranged in a repeating diamond pattern or other repeating pattern across the sheet.

- 5 The expression "fabric" used herein includes a fabric portion, and the expression "sheet" includes a sheet portion.

The spacer members may, for example, project from the sheet by a distance which is substantially constant across at least the majority of the relevant major face of the sheet,
10 so that the article conforms in use to the shape of the person or animal or the surface. Alternatively, the spacer members may be of variable length in the direction away from the sheet, for example to accommodate specific contours of the surface or the person or animal's body. The spacer members may be discontinuous or continuous. They may suitably comprise ribs or discrete or point projections extending from the sheet. The
15 spacer members may, for example, be attached to the sheet or may be integral with the sheet.

The substantially impermeable sheet may be a unitary sheet or a laminate, and is preferably elastomeric. The component(s) may be foamed or unfoamed. If foamed, the
20 foam structure can be closed-cell or open-cell. While an open-cell foam will normally have some inherent permeability, such a foam is still understood to be "substantially impermeable" in the context of the present invention if the presence of perforations makes a recognisable improvement to breathability. Suitable elastomeric materials include synthetic and natural rubbers, for example neoprene rubber, and/or synthetic
25 polymers of all types. In the case of a laminate, different materials may if desired be used for different lamina.

The sheet is preferably a sheet of the general STOMATEX type described above. Most preferably, the second major face of the sheet is provided with dome projections in the
30 region of each perforation, corresponding with the hollow chambers of the first major face of the sheet. In use, the domes flex as the pressure changes take place in the

chamber, and this flexing assists in the removal of moist air away from the person's skin adjacent the first major face of the sheet.

In this preferred embodiment, the spacer members are adapted to maintain the domes spaced from the surface and thereby to prevent inhibition of the flexing action during
5 normal use.

The spacer members preferably project from the second major face of the sheet by an amount which is substantially the same across at least the majority of the second major face of the sheet, so that the article conforms in use to the shape of the surface. The
10 spacer members are preferably of sufficient resilience that the perforations of the sheet remain open to the second side of the article during normal use, i.e. so that the second side of the article is not normally pressed against the surface.

The spacer members may suitably comprise a network of ribs extending across
15 substantially all of at least one side of the article or fabric, the ribs thereby providing walls beside each dome projection of the second major face of the sheet. If desired, the air space thereby defined over the dome projections can be covered by an air-permeable sheet cover member extending between the ribs and secured (e.g. sealed) thereto.

20 In a particularly preferred arrangement an air-permeable sheet cover member may be a water-absorbent cloth or other fabric, e.g. of hydrophilic fibres such as high-wicking microfibres, particularly polyesters. Such a cover member provides a high wicking action which absorbs moisture passing out through the perforations of the sheet from the first to the second major face of the sheet. In this way, the surface against which the
25 article is located can be maintained as dry as possible. Alternatively, the air-permeable sheet cover member may, for example, be a waterproof but vapour-permeable membrane. Still further, such a waterproof but vapour-permeable membrane may be used together with a water-absorbent fabric, e.g. externally of the water-absorbent fabric to confer waterproofness. If desired, such a composite may be a laminate with the
30 different layers being bonded together in conventional manner.

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The surface against which the article of the present invention can rest may be rigid or flexible, perforated or unperforated, permeable or impermeable. The article of the present invention can also be wound around a part (e.g. a limb) of a person or animal's body, in which case the "surface" will be that portion of the article which is wound over the portion of the article adjacent the person or animal's body, i.e. the article (e.g. a
5 bandage) will be wound over itself.

The article of the present invention may, for example, take the form of the following facing, cushioning and lining articles permanently or releasably affixed to any surface, or for wearing or locating between a person or animal and any surface:

10

(a) apparel of all types, such as watersports apparel, and portions of such apparel (e.g. the seat portions of trousers);

15

(b) the fabric portions of wheelchairs (e.g. the seat, back and armrest portions);

(c) facing, cushioning and lining for seats of all types, such as automotive seating, office seating, domestic seating, boat seating, commercial travel seating (e.g. bus, train and aircraft seating);

20

(d) headwear of all types;

(e) boot and shoe insoles and linings, in which case the surface is the interior surface of the boot or shoe;

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(f) helmet linings, in which case the surface is the interior surface of the helmet;

(g) linings for body protectors, in which case the surface is the interior surface of the body protector;

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(h) linings for body armour, in which case the surface is the interior surface of the body armour;

- (i) linings for sports shields such as shin-pads, in which case the surface is the interior surface of the sports shield;
- (j) under-blankets for bedding, in which case the surface is the upper surface of a mattress or the like;
- 5 (k) upholstery covers, in which case the surface is the surface of the upholstery;
- (l) linings for clothing, in which case the surface is the interior surface of the clothing;
- 10 (m) orthopaedic cast linings, in which case the surface is the interior surface of the orthopaedic cast;
- (n) linings for orthopaedic supports or hard braces, in which case the surface is the interior surface of the orthopaedic support or hard brace; and
- 15 (o) portions of the above if not specifically mentioned, particularly portions that are subjected to compressive forces in use.

20 The article of the present invention may also take the form of medical or veterinary dressings, which may for example be held onto the body by an overlying member (optionally with or without a contact adhesive between the dressing and the skin of the person or animal) or by winding the dressing onto itself around a part of the body (e.g. a limb).

25

The basic principle underlying the preferred mode of action of the perforations of the sheet is set out in WO-A 91/12958. This basic principle is retained when a corresponding sheet is provided with spacer members according to the present invention. In essence, evaporation of sweat from the skin surface of the person causes

30 an increase in the vapour pressure (density) within the hollow chambers of the sheet. Movement of the person's body, for example by walking in the case of an insole as the article of the present invention, will cause compression of the sheet and consequent

distortion of the chambers and the domes. This leads to active pumping of the vapour from the chambers, through the perforations and out to the second side of the article. Here it will tend to condense, because the temperature is lower away from the wearer's body.

- 5 When the spacer members are provided with an air permeable, hydrophilic fibre, absorbent sheet cover member, enclosing an air space over the dome projections of the second major face of the sheet, condensed sweat will be absorbed into the fibres of the absorbent cover member. Sweat may not pass back through the perforations after condensation. Even when the sweat is still vaporous in the air space over a dome
10 projection, it will not return to the chambers of the first major face of the sheet due to the positive thermal and diffusion gradient from the first to the second major face of the sheet.

- The perforations and associated chambers are suitably of sufficient size and spacing
15 apart to permit the natural biological functions of the user's skin to continue substantially unhindered over a desired period of time, while permitting a controlled (but not excessive) retention of the user's body heat.

- The components of the article or fabric should be non-toxic, non-irritant and
20 comfortable to wear (in the sense of lightweight, flexible and soft to the touch), as well as being resistant to attack and degradation from all natural by-products of the user's body (e.g. sweat, blood, tissue fluid, urine, pus, and gases such as carbon dioxide).

- It is preferred that the article will provide substantial protection to the wearer from cold
25 or other external hazards (e.g. water, chemicals, bacteria, air etc), while permitting an enhanced air-exchange efficiency as soon as high levels of wearer activity arise, which cause the perforations to open due to flexing of the article and/or the higher temperatures and pressures within the chambers of the sheet. In such articles, the perforations may conveniently be interspersed with smaller numbers of other types of
30 perforation according to the present invention and/or other (e.g. conventional) perforations. In one particular form, the perforations open when the vapour pressure of moisture in the chamber(s) reaches saturated vapour pressure.

By selecting particular elastomeric materials, particular lamina thicknesses, particular sizes of chambers and perforations, different concentrations of perforations over the sheet area and/or different arrangements of perforation types over the area of the sheet, the article's properties can be adjusted to suit the intended use. Moreover, by careful selection of materials and configuration, the article can be made to respond in its

5 "breathability" to variations in external conditions and/or in the user's biological functions, so that to some extent such articles can self-regulate their "breathability" and hence automatically control the environment next to the wearer's skin within a pre-set temperature range.

10 The fabric and articles made therefrom may be manufactured according to conventional methods. Thus, for example, a foamed or unfoamed elastomeric sheet can be press-formed, e.g. by thermoformation under pressure, or vacuum-formed, to provide the required chambers, domes and space members and the sheet can be perforated by pins to provide the perforations. The perforation of the sheet can be simultaneous with the

15 press-forming or vacuum-forming or at a different time from the press-forming or vacuum-forming.

Alternatively, the spacer members can be laminated to the remainder of the sheet. This will be appropriate when the resilience of the spacer members must be different from

20 that of the perforated portion of the article. In such a method, a first sheet portion of a first elastomeric material may be press-formed or vacuum-formed to provide the required chambers and domes and the sheet can be perforated by pins to provide the perforations. As before, the perforations of the sheet can be simultaneous with the press-forming or vacuum-forming or at a different time from the press-forming or

25 vacuum-forming. A second sheet portion of a second elastomeric material (typically different from the first elastomeric material) can have relatively large holes punched through it, which are large enough to comfortably receive the domes projecting from the first sheet portion. The two sheet portions can be laminated together in this configuration, whereby the second sheet portion provides the space members according

30 to the present invention.

Where additional permeable layers are to be laminated or bonded to the fabric, e.g. across the spacer members to enclosed an air space above the domes to the second major face of the sheet, this lamination or bonding may be achieved in conventional manner, using known materials and methods.

- 5 After the initial forming of the fabric, optionally with or without elements additional to the perforated sheet, as described above, the articles according to the present invention is formed from the fabric by any suitable means, e.g. cutting, pressing and/or stamping, and any desired additional elements conventional to articles of the desired type may be incorporated to form the finished article. In the case of many facing, cushioning or
- 10 lining articles, no or very little processing is required after the fabric has been cut, pressed or stamped to shape. These matters will be well within the expertise of those skilled in the art, by simple analogy with the corresponding handling and processing of known fabrics.
- 15 The present invention goes at least some way to providing a simple, inexpensive, comfortable, insulating, washable and effective facing, cushioning or lining system for wearing or locating between a person or animal and an outer covering, thereby addressing the problems described above in the introduction.
- 20 For ease of understanding of the present invention, and to show how it may be carried into effect, embodiments will now be described, purely by way of example and without limitation, with reference to the accompanying drawings, in which:

Figure 1 shows a partially cut away perspective top view of a fabric from which a

25 breathable article can be manufactured.

Figure 2 shows a schematic side view of part of the fabric of Figure 1; and

Figure 3 shows an enlarged schematic side view of part of a modified fabric

30 incorporating a cover member to enclose an air space over the second major face of the sheet.

Referring to the drawings, in which like parts are designated alike, there is shown a fabric sheet 1 from which a breathable article can be manufactured. The fabric sheet has first 2 and second 3 major faces defining first and second sides of the fabric. These first and second major faces of the fabric sheet 1 will be directed towards corresponding first and second sides of the finished article. In use, an article manufactured from the fabric will be near a person or animal's body 4, the person/animal being to the first side 2 of the fabric and a surface 5 being to the second side 3 of the fabric so that the article is disposed between the person/animal and the surface.

The fabric sheet 1 consists of a sheet formed of foamed elastomeric neoprene having small pin-prick sized perforations 6 provided therethrough. Circular hollow chambers 7 are provided in the first major face 2 of the sheet, one in the region of each perforation 6, so that a perforation coincides with the apex of each chamber. The second major face 3 of the sheet is provided with dome projections 8, one in the region of each perforation 6, so that a perforation also coincides with the apex of each dome.

The arrangement permits air passing from the first to the second side of the fabric to accumulate in a chamber 7 under increased pressure prior to passing out through the perforation 6 to the second side of the fabric. During this process, the elastomeric sheet can flex, both under the effect of the pressure changes and as a result of mechanical bending. These flexing movements contribute to a positive pumping effect which causes an efficient transfer of moisture-laden air through the fabric from its first to its second side.

There is further provided a plurality of spacer members in the form of ribs 9 which project from the second major face 3 of the sheet between the perforations 6 and serve to space an article made from the fabric from the surface 5, whereby the flexing action can continue unhindered, even if the person's weight tends to squash the article 1 against the surface 5.

The elastomeric materials may, if desired, be covered by a thin layer of a skin-compatible material (not shown), which may suitably be a woven natural and/or synthetic cloth, comprising cotton, nylon or mixtures thereof. The ribs 9 are shown

integral with the sheet, but may alternatively be laminated to the sheet as described generally above.

Referring particularly to Figure 3, the sheet 1 may further have a water-absorbent fabric layer 10 (e.g. a hydrophilic microfibre woven fabric) bonded to the ribs 9 so as to
5 enclose an air space above the dome projections 8, each air space being bounded by a projection 8, the ribs 9 and the water-absorbent fabric layer 10. As described above, the water-absorbent fabric layer may, if desired, be replaced or supplemented by a waterproof but vapour-permeable membrane, for example to confer waterproofness.

10 The absorbent fabric layer 10 preferably exhibits a high wicking effect and absorbs any liquid water which contacts it. This retains moisture within the fabric, and restricts condensation on the surface 5. The fabric is easily replaced or washed periodically to eliminate the accumulated moisture. Provided that it is hygienic and acceptable to do so, the fabric could alternatively be dried overnight for reuse, without washing.

15 After the fabric is formed, a wide range of articles according to the present invention is prepared from the fabric by any suitable method, e.g. cutting, pressing and/or stamping. Examples of such articles have been recited above, and will not be repeated again. If the article conventionally has a sheet component and other elements associated with the
20 sheet, those other elements will be incorporated in generally conventional manner to form the finished articles. In many cases, however, simple facing, cushioning or lining articles will require no or very little processing after the fabric has been cut, pressed or stamped to shape. These matters will be well within the expertise of those skilled in the art, by simple analogy with the corresponding handling and processing of known
25 fabrics.

The illustrated fabric is suitably manufactured by conventional press-forming or vacuum-forming of a foamed neoprene sheet, to form the chambers 7, domes 8 and spacer members 9. If desired, the water-absorbent fabric layer 10 may be bonded to the
30 spacer members 9 in conventional manner using conventional contact adhesives. The perforations 6 may suitably be formed by pins, optionally simultaneously with the press-forming step.

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The illustrated fabric is found to maintain its breathability and the advantages of the active pumping effect of the domes 8 and chambers 7, even when it is being compressed by the weight of a person. This significant advantage has not hitherto been available, and has severely limited the application of advanced breathable fabrics to uses as linings within a relatively tightly fitting outer covering.

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The foregoing broadly describes the present invention without limitation to the particular illustrated embodiments. Variations and modifications as will be readily apparent to those of ordinary skill in this art are intended to be included within the scope of this application and subsequent patent(s).

10

CLAIMS

1. An article comprising a sheet having first and second major faces directed respectively to first and second sides of the article and adapted to be disposed at least intermittently in use between, to the first side, a part of a person or animal and, to the second side, a surface, the sheet being formed of a substantially impermeable material having perforations provided therethrough, characterised in that there is further provided a plurality of spacer members which project from at least one of the said major faces of the sheet between perforations of the sheet for spacing the sheet from the said part of the person or animal, from the said surface, or from both of these, whereby in use between both the surface and the part of a person or animal the article is breathable to restrict discomfort to the person or animal.
2. A breathable article according to claim 1, wherein the spacer members project from at least the second major face of the sheet for spacing the sheet from the said surface.
3. A breathable article according to claim 2, wherein the spacer members project from only the second major face of the sheet.
4. A breathable article according to claim 1, wherein the spacer members project from at least the first major face of the sheet for spacing the sheet from the person or animal.
5. A breathable article according to claim 4, wherein the spacer members project from only the first major face of the sheet.
6. A breathable article according to any preceding claim, wherein the spacer members project by a distance which is substantially the same across the relevant major face of the sheet, so that the article conforms in use to the shape of the person or animal or the surface.

7. A breathable article according to claim 6, wherein the spacer members project from the second major face of the sheet and have a sufficient resilience that the perforations of the sheet remain open during normal use and the second side of the article is not normally pressed against the surface.
- 5 8. A breathable article according to any one of the preceding claims, wherein the spacer members are discontinuous.
9. A breathable article according to any one of claims 1 to 7, wherein the spacer members are continuous.
- 10 10. A breathable article according to claim 9, wherein the continuous spacer members extend across substantially all of at least one side of the sheet.
11. A breathable article according to claim 9 or 10, wherein the spacer members
15 comprise a network of ribs on the respective side or sides of the sheet.
12. A breathable article according to claim 11, wherein an air-permeable sheet cover member extends between adjacent ribs and is secured thereto to enclose an air space between the ribs.
- 20 13. A breathable article according to claim 12, wherein the air-permeable sheet cover member comprises a water-absorbent fabric.
14. A breathable article according to claim 12, wherein the air-permeable sheet
25 cover member comprises a waterproof but vapour-permeable membrane.
15. A breathable article according to any preceding claim, wherein the sheet further includes a hollow depression or chamber provided in the first major face of the sheet in the region of each perforation.
- 30 16. A breathable article according to claim 15, wherein the depression or chamber is so configured and arranged as to permit air passing from the first

to the second side of the article to accumulate in the depression or chamber under increased pressure prior to passing out, through the perforation, to the second side of the article.

17. A breathable article according to claim 15 or 16, wherein at least one of the
5 depressions or chambers is associated with more than one perforation.
18. A breathable article according to any one of claims 15 to 17, wherein the
second major face of the sheet is provided with a dome projection in the
region of each perforation, each dome projection corresponding with a
10 hollow depression or chamber of the first major face of the sheet.
19. A breathable article according to any one of the preceding claims, when
permanently or releasably affixed to the surface.
- 15 20. A breathable article according to any one of the preceding claims, being a
facing, cushioning or lining article for wearing or locating between a person
or animal and a surface selected from the surfaces of apparel and clothing and
portions thereof, seats and portions thereof, wheelchairs and portions thereof,
headwear, footwear, body protectors, body armour, sports shields, bedding,
20 upholstery coverings, orthopaedic casts, orthopaedic supports, orthopaedic
hard braces, and other articles against which the body of the person or
animal, or a portion thereof, can be pressed in use.
21. A breathable article according to any one of claims 1 to 19, being a medical
25 or veterinary dressing.
22. A breathable fabric comprising a sheet having first and second major faces
and formed of a substantially impermeable material having perforations
provided therethrough, characterised in that there is further provided a
30 plurality of spacer members which project from at least one of the major
faces of the sheet between perforations of the sheet for spacing the sheet in

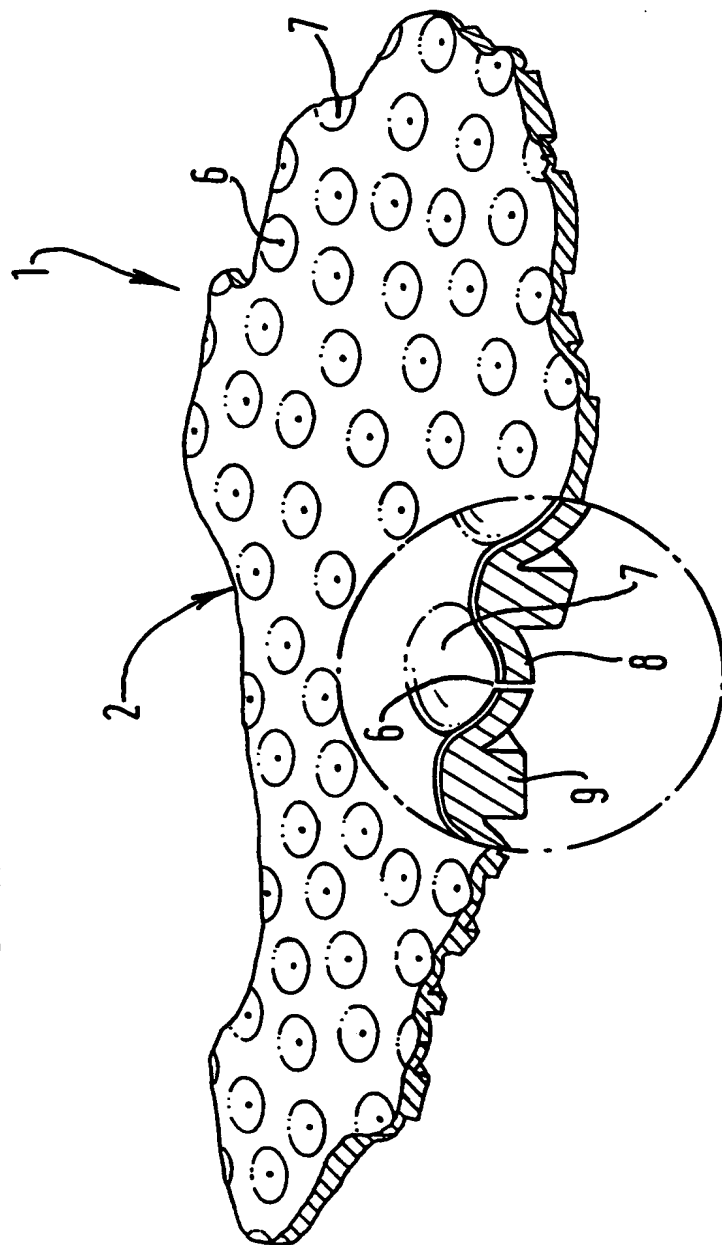
- 17 -

use from a part of a person or animal, from a surface, or from both of these on opposite major faces of the sheet.

23. A breathable fabric according to claim 22, wherein the spacer members project from at least the second major face of the sheet for spacing the sheet from the said surface.
24. A breathable fabric according to claim 23, wherein the spacer members project from only the second major face of the sheet.
25. A breathable fabric according to claim 22, wherein the spacer members project from at least the first major face of the sheet for spacing the sheet from the person or animal.
26. A breathable fabric according to claim 25, wherein the spacer members project from only the first major face of the sheet.
27. A breathable fabric according to any one of claims 22 to 26, wherein the spacer members project by a distance which is substantially the same across the relevant major face of the sheet.
28. A breathable fabric according to any one of claims 22 to 27, wherein the spacer members are discontinuous.
29. A breathable fabric according to any one of claims 22 to 27, wherein the spacer members are continuous.
30. A breathable fabric according to claim 29, wherein the continuous spacer members extend across substantially all of at least one side of the sheet.
31. A breathable fabric according to claim 29 or 30, wherein the spacer members comprise a network of ribs on the respective side or sides of the sheet.

32. A breathable fabric according to claim 31, wherein an air-permeable sheet cover member extends between adjacent ribs and is secured thereto to enclose an air space between the ribs.
- 5 33. A breathable fabric according to claim 32, wherein the air-permeable sheet cover member comprises a water-absorbent fabric.
34. A breathable fabric according to claim 32, wherein the air-permeable sheet cover member comprises a waterproof but vapour-permeable membrane.
- 10 35. A breathable fabric according to any one of claims 22 to 34, wherein the sheet further includes a hollow depression or chamber provided in the first major face of the sheet in the region of each perforation.
- 15 36. A breathable fabric according to claim 35, wherein the depression or chamber is so configured and arranged as to permit air passing from the first to the second side of the fabric to accumulate in the depression or chamber under increased pressure prior to passing out, through the perforation, to the second side of the fabric.
- 20 37. A breathable fabric according to claim 35 or 36, wherein at least one of the depressions or chambers is associated with more than one perforation.
- 25 38. A breathable fabric according to any one of claims 35 to 37, wherein the second major face of the sheet is provided with a dome projection in the region of each perforation, each dome projection corresponding with a hollow depression or chamber of the first major face of the sheet.

FIG. 1.



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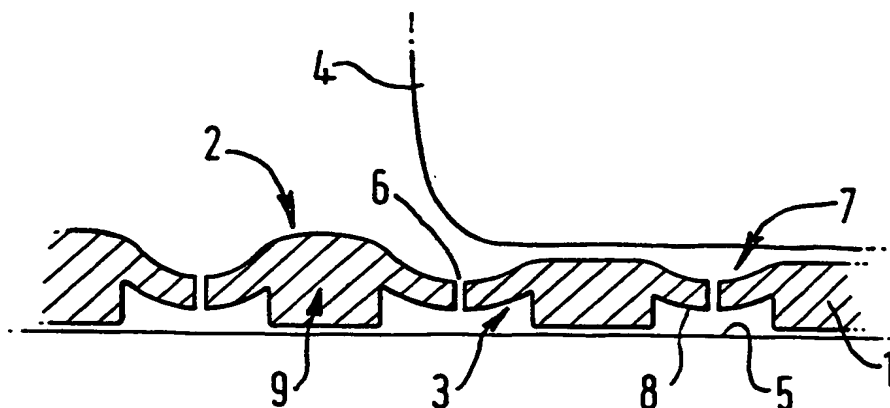


FIG. 2.

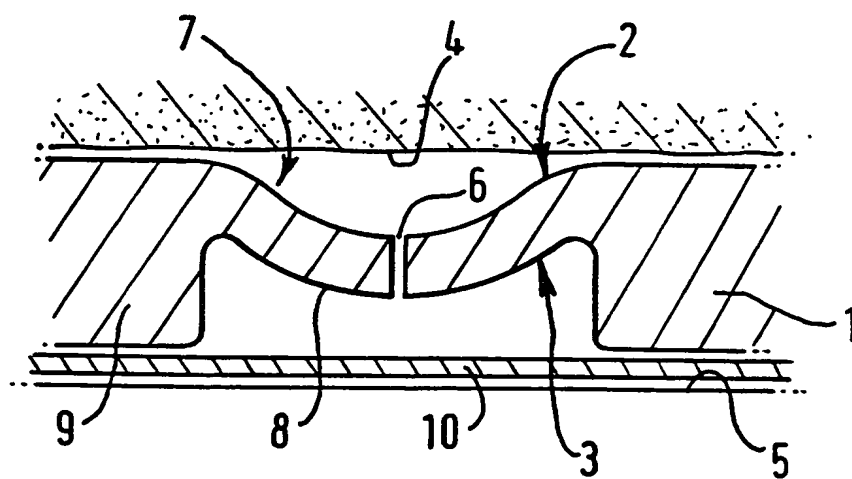


FIG. 3.

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/GB 99/04161

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C08J5/18 A41D31/02 B32B3/10 B32B5/02 B32B27/08
B32B3/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C08J D06N A41D B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 91 12958 A (ARMSTRONG THOMAS BRANIGAN ;MIDDLETON NIGEL JOHN (GB)) 5 September 1991 (1991-09-05) cited in the application page 4, line 20 - line 27 page 5, line 1 - line 6 page 8, line 29 -page 9, line 1 page 11, line 18 - line 23 page 14, line 1 - line 10; figure 2A ---	1
A	GB 2 312 643 A (TSAI CHANG CHUNG) 5 November 1997 (1997-11-05) the whole document ---	1
A	WO 96 28054 A (MIDDLETON NIGEL JOHN) 19 September 1996 (1996-09-19) the whole document -----	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

8 February 2000

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15/02/2000

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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